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# USSR REPORT

# ENERGY

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## CONTENTS

FUELS

FUELS

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# DEPUTY GAS-INDUSTRY MINISTER OUTLINES OFFSHORE OIL, GAS PROGRAM

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 81 pp 2-4

[Article by Yu. V. Zaytsev, first deputy minister of Gas Industry: "The Oil and Gas Resources of the Shelf: Development Practice and Prospecting Problems"]

[Text] Along with the existing amounts of the USSR's forecast recoverable reserves of oil and gas on dry land available for creating a more stable fuel and power base for the country, it was decided in 1978 to boost the development of offshore operations, and for this reason the material, equipment, financial and labor resources of a number of ministries previously occupied with questions of developing the shelf were concentrated in one state organ--the Ministry of Gas Industry.

This measure permitted a new organizational structure for the integrated development of work on the continental shelf to be introduced and 9 large regional industrial-production, scientific-research and design organizations, which include more than 250 enterprises, to be created in 1979.

Simultaneously, work on the prospecting, exploration and introduction into operation of offshore oil and gas fields was intensified substantially.

In 1980 the volume of integrated geophysical research rose 1.7-fold over 1978, the number of promising structures that were found doubled, and the areas prepared for deep exploratory drilling had increased 2.3-fold over 1978.

During the period 1979 through July 1981 nine areas were introduced to deep drilling, including the Odopta and Chayvinskoye imeni 28 Aprelya in the Caspian, at which the industrial-test recovery of oil commenced at a water depth of 84 meters. The construction of a fixed platform in water 110 meters deep is being completed here now, and the fabrication of modules for a platform in 120 meters of water has been started. Here in the Caspian, the world's deepest offshore well has been put into operation, producing about 1 million cubic meters of gas per day from a depth of 6,200 meters. The Golitsinskoye gas-condensate field in the Black Sea, from which an underwater gas pipeline is being built to the shore, has been prepared for industrial-test operation. Gas recovery will start here in 1982.

In the Baltic Sea, a fixed ice-resistant platform is being built on shore and prepared for installation offshore. The first well from it is to be driven next year.

The ship "Sevastopol'," which has been reequipped as an ice-resistant fixed platform and stationed in the Pechora Sea, has started to drill a hole 5,000 meters deep.

The pace of explorational drilling from artificial islands has been building up at the shallow-water shelf of Sakhalin Island, where, beginning in 1983, offshore oil recovery is planned.

Definite positive results have been achieved in the area of improving the equipment and the technology for recovering, transporting and treating oil and gas resources. Thus, the share of the highly effective gaslift method of operation has been raised to a substantial degree at existing oilfields through the introduction of special modern domestic equipment. Highly productive installations for drying gas, which to a great extent have raised the quality of the gas that is delivered to trunk gas pipelines, has provided for a reduction in losses of gas and condensate and also in the consumption of methanol. Bushing-free deep pumps, which enable the time between well repairs to be extended, and hydraulic-drive pumping jacks, which provide for a substantial reduction in construction and installing work when oilfield facilities are being built up, have found application for the first time.

Thanks to the introduction into operation of an underwater oil pipeline from Neftyanyye Kamni to the shore, rhythmic delivery of oil to the refineries and reductions in tanker hauling and in the oil losses associated therewith have been provided for. The implementation of a separate system for gathering and transporting condensate to the Azerbaijan GPZ [gas-processing plant] has enabled substantial losses of unstable condensate to be eliminated and the plant's capacity to be increased 1.5-fold.

At the same time, wide technical reequipping of offshore operations has started. Instead of the obsolete and poorly effective method of separate drilling from fixed platforms, floating drill rigs at which, thanks to highly productive equipment and greater self-sufficiency, drilling speeds are being achieved that are 1.5-fold to 2-fold higher than those produced by the old method of mastering offshore deposits, are being used at all water bodies. Thus, the self-elevating "Sivash" installation in the Black Sea and the self-elevating "Okha" and "Khakuri" installations on the Sakhalin Island shelf are operating successfully, and the semisubmersible "Shel'f" and "Kaspmorneft'" drill rigs are being put into operation in the Caspian Sea. Exploratory drilling from aboard the ship "Valentin Shashin" will start in the Barents Sea at the end of 1981. By the end of 1981, 9 floating drill rigs that will permit drilling at sea depths of 40 to 300 meters will be in operation at all water bodies.

The highly productive hose-and-cable drilling ship "Ali Amirov" has been put into operation to perform engineering-geology work. A number of scientific-research ships have been reequipped and supplied with the newest geophysical equipment by the ministry's own efforts.

In erecting fixed platforms offshore, a specially built floating crane, the "Azerbaydzhan," with a load capacity of 2,500 tons, is being used.

In order to do diving and underwater engineering work, 8 deepwater diving sets, which will enable work to be done at sea depths of up to 300 meters, with a lengthy stay under the water, are undergoing production tests.

Since the start of 1979 the offshore oil and gas-field fleet has been augmented by more than 40 different ships, including crane ships, multiple-purpose tugboats, passenger boats and others. Shore bases for servicing offshore operations and yards for fabricating fixed platforms are equipped with 300-ton self-propelled cranes.

The technical reequipping of geophysical ships by installing a tail up to 4 kilometers long, multiple-channel (up to 96 receivers) high-powered sources of elastic vibrations, and shipborne sets of navigation based on domestic computers have enabled standard practices to be improved and programs for forecasting oil and gas deposits by geophysical data, the so-called direct methods for prospecting, to be introduced, greatly reducing the amounts of explorational drilling and the time taken to prepare discovered fields for industrial development.

Thus, during preparation of the Chayvinskoye field for development, drilling and the expenditure of funds will be reduced 3.5-fold to 4-fold and, at the Field imeni 28 Aprelya, 2.2-fold to 3-fold, from what costs would have been if this work had been done by the old traditional method.

An integrated program of scientific research and experimental design for developing the shelf, in which more than 30 institutes of the industry and of other ministries are taking part, has been worked out and the initial actions are being executed.

Joint work in prospecting for and exploring oil and gas fields on the continental shelf of the Democratic Republic of Vietnam, the Polish People's Republic and the German Democratic Republic are being conducted successfully within the framework of international collaboration.

In assessing the results of the work accomplished, there is every reason to assert that the country has created an essentially new branch of the national economy--the offshore oil and gas industry, the main paths of whose development are as follows.

First of all, the creation of a firm supply and equipment base for offshore work must continue, in order to speed up enlistment of the shelf's oil and gas resources in the country's fuel and power balance after 1985, when the offshore oil and gas recovered will enable recoupment of the funds invested. This means, primarily, the conclusion during this five-year plan of the construction of integrated bases for servicing the offshore operations, to include drilling bases, seaports, fleet bases and yards for building fixed platforms, as well as bases for servicing and outfitting production equipment. Modern radio communications centers will be built to furnish stable radio communications of the oil and gas-field fleet with the shore.

The planned increase in the amount of special offshore operating facilities requires the creation of additional capacity for repairing them, for which purpose the construction of repair yards is specified.

A further buildup in the capacity of in-house construction and installing organizations is planned. The amount of work they do will be increased 2-fold to 2.5-fold by 1985.

Second, a no less important area for developing the industry is completion of the technical reequipping of the offshore and gas recovery subbranch of the industry, which is concerned primarily with the creation and mastery of basically new special

operating facilities for prospecting for and for exploring, recovering and transporting oil and gas.

Thus, in order to perform prospecting, highly precise instruments and equipment for deriving exhaustively the characteristics of the structures that bear oil or gas will be introduced. This will allow the amount of deep prospecting and exploratory drilling to be reduced and the fields' reserves to be determined by 2 or 3 exploration wells instead of 15 to 20. The oil and gas field fleet will be increased by almost 300 units.

The number of floating drill rigs and drilling ships equipped with the newest drilling equipment for driving holes to a depth of up to 6,500 meters will grow more than 2.5-fold. They will be outfitted with sets of instruments for monitoring and controlling drilling processes and for dynamic stabilization of the drill rigs, and other equipment that will permit offshore drilling to be conducted under extreme conditions. Along with the crane ships, multiple-purpose tugs and engineering-geology and geophysics ships, the oilfield fleet will receive for the first time special ships for diving and underwater technical operations, autonomous group and individual facilities for towing divers, autonomous habitable apparatus for work at sea depths of about 300 meters with devices for divers to exit at the seabed, and ships for hauling modules for fixed and floating drilling platforms. Oil and trash collectors and bilge-water collectors will be used everywhere, to greatly increase the effectiveness of cleaning the sea surface of crude-oil products. Special equipment for cleaning and neutralizing drilling effluent and for rendering solid drilling wastes harmless will completely preclude the possibility of polluting the water body during drilling operations.

The equipment for offshore development drilling and for the recovery of oil and gas at sea is being changed considerably. Multiple-well (30-50 wells) double-deck fixed platforms will be used that will enable drilling and recovery to be conducted simultaneously. This will greatly shorten the time for introducing discovered fields into operation and will increase capital investment effectiveness. It is especially important that such platforms be produced by industrialized methods at special yards with maximum use of the outfitted-module method of fabrication. One of these yards is being built in Baku. It will fabricate platforms for sea depths of about 200 meters.

Questions connected with developing the oil and gas resources of the continental shelf of the seas under severe climatic conditions and a heavy ice regime require the speediest possible solution. Scientists, developers and designers are to perform a major set of scientific-research and experimental-design work in the area of creating and mastering new operating facilities that will be capable of functioning reliably in the extreme conditions of the arctic and Far Eastern seas and of providing for normal and safe operation for both the operating facilities themselves and the people who operate them.

It should be noted that there are no fundamental studies of any kind in this area, not even in world practice.

Much remains to be done to train highly qualified personnel: to create special faculties in a number of higher educational institutions and to organize technical schools and vocational-and-technical education schools.

In considering the necessity to provide for the integrated solution of economic and social problems and to concentrate efforts and resources in areas of the greatest importance to the country, the Ministry of Gas Industry has worked out a broad 10-year program for developing offshore oil and gas recovery.

The realization of this program will permit offshore oilfield and gas-field workers to make a worthy contribution to the solution of some of the most important tasks that were set by the 26th CPSU Congress.



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## STATUS OF OIL, GAS EXPLORATION IN WEST KAZAKHSTAN SUMMARIZED

Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 9, Sep 81 pp 24-27

[Article by A. Zhivoderov, chief of the Geology of Oil and Gas Section of the Kazakh SSR Ministry of Geology: "The Oil and Gas of West Kazakhstan"]

> [Text] "Expand geological exploration for oil and gas in West Kazakhstan and speed up the assimilation of oilfields on the Buzachi Peninsula." (From the "Main Directions for the Economic and Social Development of the USSR During 1981-1985 and During the Period up to 1990.")

In the past decade and a half Kazakhstan has moved up to one of the leading places among the country's oil-producing republics. Special credit for this belongs by right to the geologists. During the last five-year plan they took a huge step on the road to solving fundamental problems of taking possession of the oil and gas resources that have been secreted in the lower stories of the Caspian depression's geological cross-section. CPSU Central Committee Politburo member First Secretary of the Kazakhstan Communist Party Comrade D. A. Kunayev evaluated highly the work of the underground explorers at the 15th Congress of the republic's communist party.

The results of the vast work that was done during the 10th Five-Year Plan yields rich material for broad conclusions and generalizations and will be the basis for forecasting and for developing plans for the ensuing period. But before speaking about what the explorers of the underground achieved and what the prospects and difficulties are that they face, I would like to dwell on certain concepts that have been disseminated in the geological literature to which I will refer in this article.

First, let us note that by West Kazakhstan, with which the republic's main prospects for petroliferousness is connected, is meant a vast territory that includes the Ural'skaya, Gur'yevskaya, Mangyshlakskaya and Aktyubinskaya administrative oblasts. As seismic exploration has indicated, despite the mainly monotonous, flat surface, it has an extremely complex geological structure (tectonics). Down deep are multikilometer mountains, and uplifts alternate with large depressions and troughs that have been filled over hundreds of millions of years with alluvial layers which have been transformed into hard rock sediments.

Based upon the principles of geological regionalization, in West Kazakhstan a number of independent large regions are singled out which are distinguished from each other by peculiarities of deep tectonics. The principal one among them is the above-mentioned Caspian depression. On the west it embraces the bend of the Astrakhan-to-Saratov section of the Volga River, and on the east it is bordered by spurs of the South Urals and the Mugodzhary. The greatest extent of the depression in the latitudinal direction, from Volgograd to Kenkiyak settlement, exceeds 950 kilometers. From the northern border, which passes close to Ural'sk, to the south, which approaches the Buzachi Peninsula, its length is about 640-650 kilometers. The edge portions of the depression are called "sides."

Most ancient crystalline rocks, which are buried from the sides to the center at depths of 7-8 to 20-22 kilometers, form the "bottom" of the Caspian depression and its basement. By virtue of their monolithicity, these rocks cannot contain oil or gas deposits. The basic interest here are the sediments deposited, which vary in composition and age. In the middle portion, their cross-section includes a thick (several kilometers) series of rock salt. In composition and physico-chemistry properties, most of it corresponds to the well-known native salt but has a large-crystal structure and often it is transparent. Sandy-clay, limestone and other rocks, which lie above and below the salt series, are named, correspondingly, the supersalt and subsalt series. They also are basic targets of exploration. The subsalt complex is more promising, but it is submerged to a substantial depth--from 3-5 to 10 kilometers or more.

To the south of the Caspian depression is the Severynyy Ustyurt system of troughs and highs, in the western portion of which the Buzachi arch, which is confined to the like-named peninsula and also borders on the Mertvyy Kultuk salt-lake zone, which is more submerged, is singled out.

In the south of West Kazakhstan lie the well-known oil and gas bearing Yuzhno-Mangyshlak region, where, at the start of the 1960's, the Zhetybay, Uzen' and other gas and oil fields were discovered.

Our ministry has concentrated the main volume of prospecting and exploration for oil and gas during the last five-year plan in areas of the Caspian depression and the Buzachi Peninsula, plus the Mertvyy Kultuk salt lake region, which is adjacent to it. This work was concentrated to a much lesser extent at Severnyy Ustyurt and in southeastern Kazakhstan. Such an approach is justifiable. Thus, in 1976-1980, geological explorers found 18 new fields of hydrocarbon raw material, 10 of them in the Caspian depression. Among the latter are three promising ones--the Kalamkas gas-and-oil field on the Buzachi Peninsula and the gas-condensate-and-oil and gas-condensate fields of Zhanazhol and Karachaganak, which are situated, respectively, on the eastern and northern sides of the depression.

The main and final goal of the prospecting and exploration was to build up mineral raw-material reserves suitable for development. Our ministry fulfilled this task successfully: growth of oil and gas reserves reached 107.7 percent of the plan, almost doubling the level achieved during the preceding five-year plan. The geological and economic effectiveness of the work done was also raised substantially. Thus, estimated prospecting and exploration expenditure per ton of raw material was reduced by 27.7 percent for oil. Correct choice of the most promising areas for prospecting and concentration of the main efforts of oil-exploration organizations on them played the main role here. A rise in the engineering-organization

level of geological exploration work and the introduction of advanced experience and new equipment and technology also were of considerable significance.

The main volume of explored reserves was obtained on the Buzachi Peninsula, in places where, in the literal sense of the word, man has not set foot. The central and northern portions of the region, which are occupied by impenetrable salt-lake swamps, have remained inaccessible, even for the primordial inhabitants of this wilderness district--the Saygaks and Dzheyrans. From a helicopter, during reconnaissance of the locality, one easily sees numerous chains of their tracks, which are clearly imprinted on the damp surface of the salt marsh, and they stop abruptly at the edges of this zone.

Undoubtedly, it is very, very difficult to prospect under such conditions. Even seismic explorers who have been equipped with comparatively light mobile equipment and off-the-road transport bypass the swamp. It was still worse for the drillers. Heavy drill rigs, which proved to be unacceptable here, have been replaced by lightweight rigs that have been modernized in the workshops of the integrated Mangyshlakneftegazrazvedka expedition. Core drilling, with its self-propelled drill rigs, played a major role.

On the Buzachi Peninsula, in addition to the Karazhanbas, Severo-Buzachi, and Zhalgiztyube oilfields that were found in 1974-1975, one more gas-and-oil field, named the Kalamkas, was discovered in 1976.

There is much in common in the nature of these fields (except the Zhalgiztyube), and a number of positive features are characteristic of them. They are, primarily, of impressive size, the bedding of the numerous productive horizons is shallow (from 250 to 1,000 meters), and, on the whole, the level of petroliferousness, which reaches 455 meters at the Kalamkas field, is substantial. The enumerated factors give rise to a high concentration of raw-material reserves per unit of area, and this is telling on the economic effectiveness of the development and operation of the fields.

Analyses indicate that the oil of the Buzachi Peninsula fields, although it is of a heavy type, contains many valuable components that are badly needed by various branches of the national economy. The acquisition and subsequent complete use of these components is possible only with severe refining of the crude. Therefore, the question of organizing it is an extremely urgent question, one which requires the most rapid solution.

An important positive factor that will facilitate and reduce costs of the recovery gathering and transport of the output is the low congealing temperature of the Buzachi crude, which is -20 to -30 degrees Celsius. By way of comparison, Yuzhno-Mangyshlak crude congeals at +30 degrees, because of its high paraffin content.

Because the crudes of the fields that have been discovered on the Buzachi Peninsula are distinguished by high viscosity in the reservoir formations, Kazmingeologiya [Kazakh SSR Ministry of Geology] workers have set for themselves the complicated but extremely important task of substantiating the possibility of recovering the crude more completely than is the case with the methods traditionally used.

It is known from experience that, even during the development of fields of light, easily mobile crude, the major portion of it (about 70 percent) inevitably remains in the formation. Domestic and foreign experience in the development of high-viscosity crude indicates that, with natural reservoir drive, withdrawal from the productive horizons does not exceed 10 percent, and, where ordinary waterflooding of the formation is applied, it rises to only 20 percent.

During exploration of the Karazhanbas and Kalamkas fields, the Kazneftegazrazvedka administration and KazNIGRI [Kazakh SSR Scientific-Research Institute for Geological Exploration] have conducted an industrial experiment on the testing of a new method--displacement of the oil by injecting water, not ordinary water but water thickened by a synthetic polymeric substance--polyacrilamide. As a result, it was proved that oil withdrawal can be brought up to 45-50 percent by this method.

The economic benefit from introducing this method into production is obvious. It is already being used in operation of the Kalamkas field, which was started in September 1979, by the Mangyshlakneft' Association. At Karazhanbas, which also has been prepared for operation, other highly effective methods for increasing oil withdrawal--fireflooding and the injection of hot steam--are being tried.

Thus, the new Buzachi oilfield region has become operational and is building up its capacity. As computations indicate, based upon the known fields, annual oil recovery can be brought up to more than two-thirds of the current level of recovery in the South-Mangyshlak region.

However, we do not consider that the prospects for this region are restricted by this. Over the past 2 years the Mangyshlakneftegazrazvedka Expedition has discovered two new fields in the vicinity of Kalamkas which are, it is true, not large in reserves as of now--the Arman and the Karaturun. They possibly have a continuation to the north, to the Caspian's waters. There, just as at the Mertvyy Kultuk salt lake, the possibility of larger fields is not excluded. Meanwhile, the geologists cannot explore offshore, since the seawater body that is adjacent to the Buzachi Peninsula lies within a nature preserve, within which all types of work are strictly prohibited. What will the outcome be? It lies in the realization of some variant of the construction of an earthen dam that will cut off the shallow-water part of the sea in the area of Komsomolets Gulf and promote rapid drying of it. However, this plan is still far from being realized, by virtue of a number of circumstances.

With all the great practical significance of the Buzachi Peninsula fields, the most important region from the point of view of petroliferousness of the Kazakhstan region continues to be the Caspian depression. Geological exploration conducted there during the last five-year plan not only confirmed this conclusion but also set it on a basically new and broader base. The first subsalt oil and gas fields--the Kenkiyak and the Zapadno-Teplovskoye--were discovered during the Ninth Five-Year Plan. However, they are not great in size and they possess many negative features that do not allow great hopes that the major oil of the northern Caspian is linked with fields of this type.

The upper layer of the Kenkiyak subsalt, which has been drilled over to 4,300-4,400 meters, is made up mostly of sandy-clayey sediments that are not very favorable in their properties for the concentration and preservation of large deposits of oil and gas. Moreover, the mobile formation fluids in them often are found to be under anomalously high pressure (up to 700-750 atmospheres); this fact complicates

considerably the conduct of drilling work and is the cause of many serious breakdowns. Because of this pressure, heavy 100-ton columns of drill pipe have been ejected uncontrollably from the well, together with the drilling mud, which became the source of powerful blowouts and uncontrollable gushers. Such conditions have been observed at a number of other areas on the eastern side of the Caspian depression (Karatyube, Bozoba, Kursay and so on).

The geological exploration results of the last years of the 10th Five-Year Plan have given new promise. In 1978, not far from the Kenkiyak, the gas-condensate-and-oil field of Zhanazhol was found. It is important that this field is confined to an entirely different type of rock--limestones of the Carboniferous period that possess great porosity and permeability. These properties of theirs have occasioned steady high-flow gushing of wells. Thus, during operation through an 8-millimeter flow-bean orifice at well No 4, daily productivity reached 400 cubic meters of crude and 258,000 cubic meters of gas.

The Zhanazhol's crude is light (specific gravity is 0.84-0.86 grams per cubic centimeter) and possesses high quality. The height of the oily part of the deposit is 100 meters, of the gas part--about 187 meters.

The work at Zhanazhol is now being performed at a boosted pace. Forces of the Aktyubinsk and Kenkiyak Oil and Gas Exploration Expeditions have drilled here or are completing the penetration of 30 deep prospecting holes. By the end of the first quarter of 1982, the gas-condensate-and-oil deposit that was discovered will be completed by exploration and preparation for transfer to the USSR Ministry of Petroleum Industry. This will serve as a reliable base for further building up oil-recovery volume in areas of the north Caspian.

At the same time, as results obtained recently in the work on hole No 23 have shown, the potential possibilities of the Zhanazhol field will not be exhausted by the drilling over of this deposit. Below it, by 800 meters, a new productive series of limestones has been observed. In order to study this series, it is planned to drill a number of holes to 4,200-4,500 meters.

Highly promising oil-saturated limestones of the Carboniferous have been observed also in the Kenkiyak-Bozoba region, where oil gushers with a flow of up to 111 cubic meters per day have been obtained, and at certain other areas. All this advances the limestones to first priority in prospecting and exploration during the 11th and the next five-year plans.

Such a conclusion can also be drawn for the northern side of the depression, where encouraging results have been obtained that point to the industrial petroliferousness of the limestones of the Permian and Carboniferous systems. In 1979 the Ural'sk Oil Exploration Expedition discovered the Karachaganak gas-condensate field here.

As yet, only two holes have been finished at Karachaganak, which are 4,262-4,353 meters deep, and 6 more are in the drilling stage. Hole No 10 was tested for gas flow. Daily withdrawal from it was 697,800 cubic meters of gas and 708.2 cubic meters of condensate--a light transparent fluid which is almost suitable for burning in internal combustion engines. Extremely valuable is the fact that the content of the condensate reaches unusually great values--1,000-1,280 cubic centimeters per cubic meter of gas.

Today, drilling is proceeding at an outstripping pace at the Karachaganak field. However, taking the great depth of the holes into consideration, full exploration cannot be completed until the start of the 12th Five-Year Plan.

In order to speed up preparation of the field for operation, a strenuous plan was adopted that calls for the completion by 1983 of the first stage of exploration and presentation to the USSR state commission of an intermediate accounting of the reserves for confirmation.

It should be noted that one common feature is characteristic for the gases and crudes of Karachaganak and Zhanazhol, which hinders drilling and testing of the wells. This is the high hydrogen-sulfide content, which reaches 4.25 percent or more. It is not only strongly toxic but it acts destructively on drilling tools and equipment made of ordinary steels. Yet the hydrogen-sulfide containing gases are a valuable raw material for producing sulfur, for which a great demand is felt. Thus, during the drilling and accompanying operations, these conditions require that well and surface equipment be made of special grades of steel that resist the destructive action of this aggressive chemical compound.

Guided by the decisions of the 26th CPSU Congress and the 15th Communist Party of Kazakhstan Congress, our enterprises will increase the amount of oil prospecting in West Kazakhstan as a whole by more than 30 percent over the 10th Five-Year Plan, including almost 70 percent at subsalt sediments of the Caspian depression. The latter trend is the main one. It is proposed to obtain in this way about 90 percent of the planned growth in oil reserves and more than 92 percent of the gas reserves. In so doing, high hopes are linked with a continuation and expansion of prospecting and exploration in the limestone series of the Lower Permian and Carboniferous sediments.

The zone of the eastern side of the depression that lies within Aktyubinskaya Oblast is most promising. Deep drilling here for subsalt oil will almost double during the 11th Five-Year Plan. Exploration not only of the upper level of the Zhanazhol field, but also of the lower level, both in this area and at the Kenkiyak, Bozoba, Kozhasa and other fields, is assigned first priority.

On the northern side of the depression, in Ural'skaya Oblast, the penetration of deep wells is increasing by 28 percent, and on the south side, in Gur'yevskaya Oblast, by 20 percent. Within the first of the indicated zones, the largest amount of deep drilling will be concentrated at the Karachaganak field and will be aimed at finding fields similar to it. In Gur'yevskaya Oblast, aside from a continuation of the work at subsalt sediments in the Barankul'-Biikzhal' zone, it is planned to speed up drilling in the southwestern part of the Ural-Volga interriverine area, in the area of the Astrakhan arch high.

Prospecting for oil in the supersalt sediments of the Caspian depression, because of their lesser promise, will be conducted mainly at areas that are adjacent to the Ural-Emba oilfield region. It is proposed to obtain here about 2.5 percent of the growth in oil and gas reserves that is planned for this five-year plan.

The Buzachi Peninsula and the Mertvyy Kultuk salt lake, which are within the Caspian oil and gas bearing province, are another high-priority territory for prospecting for oil.

Moreover, the exploration for and confirmation of reserves for a number of subsalt and supersalt fields of the depression (the Zapadno-Teplovskoye, Gremyach'ye, Vostochno-Gremyach'ye, Barankol', Kisimbay and Oryskazgan) and the Severnyy Ustyurt (Karakuduk) are to be completed during this five-year plan.

In order to raise further the effectiveness of oil prospecting, based upon long-term planning, Kazmingeologiya organizations, with the concurrence of the Embaneft' Production Association of USSR Minnefteprom [Ministry of Petroleum Industry], compiled a scientifically validated program for the five-year plan. This program defined the main directions for prospecting and exploration, their nature and methodology, and amounts in monetary and physical terms, and questions of supplying materials and equipment were carefully examined. Moreover, our ministry has worked out concrete organizational and technical measures for realizing the decisions of the 26th CPSU Congress and the 15th Kazakhstan Communist Party Congress. The accomplishment of what has been planned will unconditionally aid further development of the republic's oil and gas recovery industry and the achievement of qualitatively new goals.

At the same time, it should be noted that execution of the tasks posed will require that extremely serious difficulties be solved, especially during drilling at subsalt sediments. The main one of these is the great depth of the wells, which will reach 5.5 kilometers. Because of this, reliable equipment and refined technology are necessary. However, the geologists are being provided very poorly with new equipment. They suffer a constant shortage of drill pipe, rigs with a load capability of 80 ton for testing wells, instruments for deep testing, chemical reactants, various geophysical apparatus, and many other things.

In brief, the active assistance of both republic and Union organs, particularly USSR Gosplan, is required. Firm reinforcement of supply and equipment resources will enable the republic's explorers to cope successfully with the important tasks of building up oil and gas reserves and preparing the fields for operation that were advanced for the 11th Five-Year Plan.



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FUELS

## SOME INFRASTRUCTURE PROBLEMS OF URENGOY GAS FIELDS DISCUSSED

Kiev RABOCHAYA GAZETA in Russian 25 Oct, 1 & 4 Nov 81

[Article by B. Suprunyuk: "The Watch at Urengoy"]

[25 Oct 81 p 2]

> [Text] "The fields of the West Siberian region are unique. The largest of them--Urengoy--is distinguished by such gigantic reserves that it will provide for both internal requirements and for export for many years."--From the Accountability Report of the CPSU Central Committee to the 26th Party Congress.

### City Windows Look Out onto the Tundra

In speaking about West Siberia, one can begin without restraint with the most resounding words--"trailblazers, "the discovery of the century," "uniqueness," and "grandness of scale...." But let's simply present the unpresentable: the gas is suddenly extinguished in every third apartment in the country, every third enterprise is shut down, and every third motor vehicle is left at the garage....This is what Tyumen' energy resources means to us today. By the end of the 11th Five-Year Plan every such described apartment, vehicle or enterprise will be not every third but every second one--Tyumen' will be producing half of all energy resources.

Maximum effective and rational use of West Siberia's wealth has been discussed at the last four party congresses. This was not within the geologists' powers right away. The district is vast: the land of the Ob' North is greater than the total area of the FRG, France, Italy and England put together. The district is difficult: it is arctic, there is permafrost, and 80 percent of the fields discovered lie under swamps or lakes. They joke here--it has been proved statistically: there are three lakes for each inhabitant of Yamal. Here you will understand more deeply the notion of the revival of the peoples of the Far North, who have learned from the example of one family: the first Nenets composer, Semen Nyaruy, has a shaman for a grandfather and a collective farmer and USSR Supreme Soviet deputy for a father.

Where are the roots of these changes?

In Urengoy--at a geologists' settlement--we stayed for several days of bad weather with chief of the Taz Geological Exploration Expedition Vladimir Mikhaylovich Konstantinov. He is working right now where the region's underground treasures were

revealed for the first time with a powerful, threatening gusher. Konstantinov told me about the idea of setting up a monument for the celebrated R-101 discovery well, and about the life of the geologists. He himself is a geologist of the second generation; he finished the institute in L'vov and then linked his life with West Siberia.

"The whole country is working here," said Vladimir Mikhaylovich. "The same way that Tyumen' is working for the whole country. And the contributions of the Ukrainians in the nationwide job of mastering the treasures of Tyumen' is indisputably great. I cannot, of course, speak about everyone and everything as a whole in this matter, but, for example, four-fifths of all our expedition's engineers and technicians are graduates of the Ivano-Frankovsk Oil and Gas Institute. Six of our tenth-graders entered this same institute this year."

We began to recall the "Ukrainian record" on the pages of the Tyumen' workers struggle, the result of which has now become, just recently, it would seem, fantastic figures--by 1985 a million tons of oil and a billion cubic meters of gas will be obtained daily at the oblast's oilfields. Among the design institutes that were first to take upon themselves responsibility for developing Tyumen' riches was the Donetsk YuzhNIIgiprogaz [State Scientific-Research and Design Institute for the Design of Gas Industry Facilities for the Southern Economic Region]. Among the thousands of high-powered motor vehicles, without which conquest of the North is unthinkable--the Uragans, KamAZ's, and Urals--the KrAZ's have proved themselves well for today's conditions. The fame of the celebrated Annushka is deserved, and one of the first important tasks for the no-less celebrated Antey was right on Tyumen' soil. Scientists of the Institute of Electric Welding imeni Ye. O. Paton created the Sever-1 complex for resistance welding of large-diameter pipe, which has been called upon to cut heavy manual labor sharply and to greatly raise the pace of pipeline erection. The complex can replace about 100 skilled welders.....

Riding and walking about the oblast's young cities, one cannot help but notice the graffiti, which is worthy of Time and Man, not in the example of the slovenly "immortalizations" that have defiled the attractions of the Crimea and Caucasus. Now and then you encounter the SSO [Student Construction Detachment] Slavutich..., the SSO Zbruch... and the SSO L'vov--in the schools, dormitories and housing of Surgut, Nadym and Novyy Urengoy.

They gave me this statistic in Kiev, at the headquarters of the republic's students' construction detachments. More than 70,000 students from the Ukraine did 315 million rubles' worth of construction and installing work in Tyumenskaya Oblast during the Ninth Five-Year Plan. During the 10th Five-Year Plan the volume exceeded 350 million rubles' worth, although it was done with a smaller number of participants in the summer labor semester--there were 53,000.

This year fewer than 12,000 students managed to assimilate almost 76 million rublex. Khar'kov, Kiev and Dnepropetrovskaya Oblasts sent the largest detachments. Actually, young men and women from Voroshilovgrad, Vinnitsa, Odessa, Zaporozh'ye, Ternopol', Ivano-Frankovsk and other Ukrainian cities have been working in all the rapidly growing cities and settlements of West Siberia, where the windows of new construction projects look out on the taiga and tundra. They have built housing and pump and flow stations, laid utilities and service grids, and erected facilities for social and cultural purposes and for domestic amenities.

A few days ago the republic's Komsomol Central Committee announced: "We are sending another 380 people to Novyy Urengoy on Komsomol work tickets...." The new augmentation will be infused into the ranks of those thousands of Ukrainian young men and women for which West Siberia has become not only a stern and laborious place but also a splendid school of life. And, after looking back at half a century, one can recall how one of V. I. Lenin's comrades-in-arms, outstanding scientist and organizer of socialist economics G. M. Krzhizhanovskiy, noted prophetically: "The question of the use of Siberia's riches and the exploitation of these riches--is not just a question for the USSR but a question for the world order."

Order No 175

If Siberia is, as a whole, a school of life, then Novyy Urengoy is for sure one of its oldest classes. "From the darkness of the forests and from the marsh comes stringpulling"--this was said, as is well-known, about Petersburg when it was being born. The same can also be said about any city of the arctic, although actually there are no forests in this area, but, on the other hand, there is the swamp--as much as you want of it. Birch grow to a small height, in groups of four or five, as if reinforcing each other and holding each other up, the yellowing needles of the sparse larch look sunny, even in bad autumn weather, and stunted bushes bend elastically with the first wintry breath from the not-so-distant Arctic Ocean. It cannot be denied, the landscape is not lyrical.

I managed to read the conclusion of the Institute of Ecology of Plant and Animal Life of the Urals Science Center of the USSR Academy of Sciences and its flabbergasting figures. Its staff workers studied the Pur River basin (this is a little-known river in the European part of the country--the main water artery for local spots, and its width exceeds that of the main riverbed of the Dnepr at Kiev). And it was found that in the Urengoy area the average density of blood-sucking flies reaches 120 kilograms of biomass per hectare--an absolute record for the whole country. And still another average figure: -12 degrees. Here, that is the average annual air temperature. In winter 45-55 degrees below zero is ordinary.

It is in such places also that nature has hidden the most generous of all the gas fields that are known today in all the world.

Tyumen' is the first Russian city in Siberia. Historically it has happened that many young people, large numbers of them, left it. But right now the senior city has picked up a pace that no one has witnessed before. This has occurred primarily thanks to such powerful organizations as Tyumenneftegaz [Main Administration for the Oil and Gas Industry of Tyumen'], the managers of which the foreign correspondents like to call "the Soviet millionaires." The comparison, of course, is superficial, but it is founded on the fact that the main administration operates with figures and on a scale that not every country can boast. Money, materials, equipment and output--all are in the millions: rubles, tons or cubic meters. And more often than not in the tens or hundreds of millions.

Deputy Chief of the Main Administration for Geology Yuriy Borisovich Fain, by the nature of his job, is occupied with the region's future. But it arises out of a concern for today. There are so many concerns that my simple-minded question: "Is there much work?" clearly amused him. "There's enough for us, for our children, and for our grandchildren." Then he undertakes a current summation. And again the millions are set in motion. But this is as a whole. They are, for all that,

totaled up from thousands. He praises the Ivano-Frankovsk Drilling Administration, which since the start of the year has made 450,000 underground meters--30,000 more than the plan. They have one of the highest rates of output per worker for the main administration. Ukrainian geophysicists work excellently. So there are thanks for today's help. But tomorrow still greater efforts will be required of all, and by the end of the five-year plan the work volume should almost double....

Today, with Tyumen' almost surrounded by an entire necklace of new cities--Nefteyugansk, Nizhnevartovsk, Surgut, Nadym, Uray and Novyy Urengoy--it is difficult to imagine that a few years ago the debate boiled: were they to be or not to be? There were no few proponents of temporary schemes for developing the arctic tundra land. Here is what was suggested. Huts would come, one way or another, the first ones on runners, an indispensable attribute of which would be a small stove, most of which would by now have been converted into fairly comfortable housing, where even a bath would not be unusual. They would pump out the oil and gas and move on.

The proponents of this approach worked out some weighty data, primarily the fact that a fixed buildup in the North's environment would cost the state up to 20,000 rubles per person. But the state did not go to these expenses. Not temporary settlements but base-type cities, not an attack on the North but an offensive--a well-prepared, well-planned, strategic offensive; this is the master policy.

But with any strategy you cannot get along without tactics. And new cities were started, naturally with temporary makeshift housing. So it was about 7 years ago, even in Novyy Urengoy--the youngest city at the time in the oblast--"at the time" because this so-called "title" was taken from it right away and quickly placed on the spreading shoulders of Noyabr'sk.

The distance from the settlement of the geologists who discovered the Urengoy field to the city of Novyy Urengoy is, by Siberian standards, a most trivial thing--about 100 kilometers. The first motor-vehicle assault force spent almost a week making this 100. The first mobile housing started the first street, which was named Optimists' Street.

"Today we have dozens of streets," says Chairman of the Novyy Urengoy City Ispolkom Alim Grigor'yevich Dybrin. "Of course, not by far do they all have housing with all the amenities, but this problem is being resolved rapidly. While in 1979 about 13,000 square meters of housing space were introduced, in 1980 the figure was 68,400, and the goal this year is 207,000 square meters, it being contemplated that this annual mark will be maintained until the end of the five-year plan. Needless to say, the municipal-services facilities, the shopping and everyday services, and the children's preschool institutions that the city needs are being built simultaneously. And Urengoy's residents simultaneously are boosting gas recovery. Right now the country receives from us each day 250 million cubic meters of the blue fuel, and by the end of the five-year plan the gas fields' capacity will be increased more than 2½-fold.

A document issued in Kiev on 6 June last year has a direct relationship to the future of this gas field, which today is the most gigantic in the world. Order No 175 by the Ukrainian SSR Ministry of Geology states: "In accordance with an order of USSR Mingeo [Ministry of Geology], 'On Execution of the Rotating-Duty Expedition Method of Geological Exploration Operations for Oil and Gas in Glavtyumengeologiya

[Main Administration for the Geology of Tyumenskaya Oblast] of the RSFSR Ministry of Geology by Ukrainian SSR Ministry of Geology Organizations,' establish the Ukrainian Deep-Drilling Oil and Gas Exploration Expedition in the settlement of Novyy Urengoy of Nadymskiy Rayon of Tyumenskaya Oblast on 1 July 1980."

The order was issued a month prior to the day that the Novyy Urengoy settlement became a city. The Ukrainian drillers were to carry out a job completely new for West Siberia--to discover horizons that are lying at a depth of 5 kilometers or more.

Such holes had never been drilled previously into Tyumen' ground.

[1 Nov 81 p 1]

[Excerpt] The No 1 problem is the buildup of facilities in the North. All supply is from the "continent." Everything must be brought here--from bulldozers to needles, from reinforced-concrete slab to brick. This is expensive, of course--each brick, for instance, costs more than a ruble after it is hauled to the arctic (in Kiev, by way of comparison, one costs 3.5 kopecks). It is expensive, of course, as it is beyond that sea where a little heifer is a quarter-kopeck piece and a ruble for hauling. But there is as yet no other way. And, moreover, the work of erecting drill rigs is not entirely simple or cheap. The derrick erectors arrived here soon after the builders. V. V. Perchik, N. S. Spondych, V. V. Stepanchak, O. L. Ivanov, N. L. Fedun'v and their comrades erected the first drill rig. In July of last year the expedition drilled its first prospecting hole.

The mission set for the Ukrainian geological explorers was ordinary for them--an absolute majority of the people here had worked previously at Zapukrgeologiya [West Ukraine Geological Association], and many had, for more than a year, "made holes" in the Carpathians, which in complexity of structure exceed almost all the country's regions. Within the southern dome of the Urengoy field it is necessary to confirm the seismic explorers' forecast data about the promise of sediments at depths of 3,800-5,000 meters. The upper horizons had been studied fairly well and are already being operated effectively, and, if its "lower stories" also demonstrate large accumulations of hydrocarbons, then the field will actually receive a "second wind." The region of the activity is about 1,000 square kilometers.

The expedition's main production task is drilling work by the rotating-relief expeditionary method for a full cycle of derrickbuilding, drilling and testing of holes. This method calls for a two-week cycle of work in the arctic, which is followed by two weeks of rest at home in the Ukraine. The workday per shift is 12 hours. Saturday and Sunday also are workdays. The rhythm, of course, is not entirely ordinary, but, in the opinion of those with whom I was able to talk on the subject, it is completely within accepted medical and hygienic parameters and does not cause a person's health any harm.

"One can work!" chief of drilling of R-266 Roman Andreyevich Zdrenik gives a chop with his hand. "And work good! We came here scarcely a full brigade after completing a well 5,230 meters deep in Turkovskiy Rayon, in L'vovskaya Oblast. The drillers, the drillers' helpers and the diesel operators are experienced people. Yusif Ivanovich Didun and Vladimir Ivanovich Kosich have 20 years' drilling seniority each; they have worked in the GDR and in Afghanistan. Semen Semenovich Tarchanin, Yaroslav Moiseyevich Voznyak, and Vasiliy Il'kovich Sosenko and others have a little less seniority, but neither are they lacking in experience. And I

cannot help but say this. We have overfulfilled our plan for October, and we have now reached the 3,340-meter mark, but soon," here Zdrenik paused, "we will stop."

"What for?"

"There are no chemical reactants--one. High-strength tools for deep drilling--two. Special clothing--felt boots and caps and short sheepskin coats--three. And the deepest well at Urengoy will have to be drilled during the winter. And formations with anomalously high pressure will have to be penetrated--we have actually come to them already but we do not have the right to drill faster than 4 meters per hour. How can all these 'have to's' be dealt with?"

The Failure Factor

A meeting of the activists had been held on the eve of this conversation. They spoke about the work results for the first 9 months of the year. In the small reading and recreation room of the dormitory there were not enough places for everyone, so the conversation went on--in the direct sense of the word--with open doors: you came and listened, and no "hallway" comment or question went without attention. Expedition chief O. I. Kostyuk laid out the figures: "total amount of work--110.9 percent, output in monetary terms--114.9 percent, drilling was started on another 3 wells in 1981, and it looks as if we have gotten out of a difficult financial situation--the expedition's arrears has been reduced from 4 million to 1 million rubles, and there are prospects of a complete clearing of the books with Stroybank."

This is a plus. On the minus side, there is nonfulfillment of plans for penetration and net effective speed, the matter of well testing that had been planned has not been completed, and three brigades out of four are not "pulling" the plan. The main factors that affect such a state of affairs are inadequate supply of materials and equipment for the drill rigs, especially high-strength drill pipe and casing, chemical reactants and spare parts for the drill pumps, and lack of a technically equipped industrial base, and, besides, operating and labor discipline still are not as high as they should be.

In one way or another these same propositions were analyzed in the speeches of the chief of the derrickbuilding department B. A. Lapchuk, drilling foreman I. I. Gaychak, chief of the economic planning division M. A. Men', and others. Here are some excerpts from a writing pad.

"I am completely disappointed with supply. A real reform is simply necessary in this matter...."

"We can meet the plan, but each person will have to carry out his obligations with precision...."

"If there will be no tools for deep drilling, then we are squandering holes."

"What do we have for cement? Might as well throw it out right away instead of after 'waiting on cement....'"

"People come here not 'for the haze,' not 'for the smell of the taiga,' the more so since there aren't any, but for work, yet we cannot always organize it properly."

"Somehow we have bred too many servicing personnel. The drillers received 591,000 rubles in pay for the first 9 months of the year, the production-services base 672,000. Where is the logic?"

...Oleg Ivanovich Kostyuk, while we were riding around the wells, explained to me in popular terms this expression, "failure factor," which is current among the geologists. You have hit the nail on the head with the first well and received the expected result, your success factor is unity. You hit the second, it is 0.5, the 10th--it is 0.1. Right now this homespun arithmetic is not in favor: it is too disadvantageous to drill "on the off-chance." The scientists' forecasts, the geophysicists' computations, and the work of many other people go ahead of the geologists. One can talk completely seriously about success and failure irrespective of luck, because, as a rule, economic and technological circumstances engender them.

On Tyumen' ground, not only three-figure plan-fulfillment percentages for various counts but also extremely worrisome failures awaited the Ukraine's geological explorers. There was, nevertheless--it is impossible not to recognize it--an element of boastful confidence of an easy victory on the part of the drillers: "we took the Carpathians, we'll take the North even easier--or else there'll be rocks!" This weakens discipline and deadens attention. Thus, this led to a ChP [extraordinary incident] at drill rig R-114, which they are now officially calling a "complication."

R-114 was the expedition's first well. At the end of this April, during the first hour after midnight, when the well had been brought to a depth of 3,638 meters and oil and condensate had been found at intermediate horizons, according to mud logging, an intense gas show suddenly commenced. The blowout preventer was closed and the pressure continued to rise, reaching 180 atmospheres in 3 hours. The mud was hastily weighted and injected--but the gas show was not curtailed. By the start of May the entire reserve of weighting material--about 1,000 tons of barite--had been expended; the well simply absorbed it. Even rubber crumb did not help. As a final result, 1,800 tons of barite were expended, and the gas show still was not under control. At a depth of about 3.5 kilometers a cement plug was installed to shut off the well, but the whole drilling tool stuck in the ground. All attempts to remove it still did not bring any result. Hydrates--simply speaking, ice plugs--held it in a death grip.

In the North it is sometimes easier to write something off than to save it. Once, not far from a highway that was being built, a new marshgoing vehicle could be seen, sunk almost to the top of its cab. Driven into the swamp through bravado or incompetence, it could not get itself out despite all its hundred horsepower. The road engineers standing there began to think about how much it would cost to save it. It was discovered fairly rapidly that filling in soil alone from the road to the marshgoing vehicle would be about 10,000, and even this was not a guaranteed lifeline.

That's how it was also with R-114. Many prominent specialists advised that three hydrocarbon deposits already discovered by a hole be given consideration and that they go by other wells down to the deep formations with anomalously high pressure. Recently it was decided, nevertheless, to save the well.

"It will be costly to overcome it," said geologist Rostislav Lototskiy and shift chief Yuriy Kashpor, excitedly interrupting each other. Both specialists were still young, although they knew the exploration business in both Siberia and Sakhalin. "We were simply not prepared at all for work in an arctic zone that has high pressures. The fault here is ours, and that of our clients, who could have informed us in more detail about the specifics of working under such conditions. But lessons have been learned from No 114. We have another design at all the other wells. After every 50 meters of penetration, studies are made of the gas-field geology. Greater attention is now being paid to the reserve of chemical reactants for preparing the mud. Drilling speeds have been reduced in these formations, which can bring riddles and unpleasantness. It is difficult to say whether we will save the well. But we must risk it, the more so since there are several ways of doing so."

...Yes, it is not easy to come by the deep meters.

[4 Nov 81 p 2]

[Extract] The Airplane Goes to Work

The obligations that chief of Glavtyumengeologiya [Main Administration for Geology of Tyumenskaya Oblast] Yuriy Dmitriyevich Loganov is carrying out were explicit, even severe.

"We counted on the Ukrainian drillers so much. And they let us down. Were they poorly supplied, you say? They were not the only ones. But even that matter would not lead to accidents. But the point is this: they still have not drilled a single well through to the end! I consider that they relaxed. From that comes mistakes. We need the planned meters. The Ukrainian expedition doesn't have any. It is not necessary to fly them to work over the ends of the earth by airplane in order for them not to accomplish anything."

The categorical attitude of Yu. D. Loganov is entirely understandable. Glavtyumengeologiya has the Ukrainian Oil and Gas Exploration Expedition under contract, and receives wages for it, ceilings for the work, and so on, but the main administration still does not feel any return. The intermediate administrative link between the main administration and the expedition is Urengoyneftegazgeologiya [Urengoy Oil and Gas Geology Association], which has its hands full with its own concerns. So its deputy general director, Yevgeniy Stepanovich Pributkov, takes this position: "I would not say that the Ukrainian drillers must be counted in the ranks of those who are completely lagging. They work soundly enough, they build well, and their navigation, on which future prospects depend to a great extent, was done well. As for supply, we cannot give them everything, for we ourselves are left, as they say,'without any pants...."

Characteristic of the relationships of the main administration and the expedition is this exchange of radiograms (in September):

"Urgent Glavtyumengeologiya, to Loganov. Drilling of R-266 has been stopped by a lack of chemical reactants, and other drill rigs also are on the verge of stopping. Going deeper is fraught with accidents. Urengoyneftegazgeologiya Association is not in a position to extend assistance. I earnestly ask you to find it possible to allocate the shipment of 50 tons of chemical reactants by Il-76. Kostyuk."

...Without the chemical reactants the drillers can do nothing at the well. They are needed for support of the mud's required parameters. The muds are varied in composition, but most of them are not so complicated. The one in shortest supply is KMTs-600, for example, ordinary glue that builders use to apply wallpaper. It also is among those 50 tons that the expedition manager requested from the main administration manager.

An answer came 5 days after the radiogram....

"Novyy Urengoy, Kostyuk. The main administration's estimated requirement for chemical reactants is being met by 30 percent. Because of this, all enterprises are experiencing a severe need for them. The main administration has absolutely no reserve. There is no possibility of meeting your request. Get the chemical reactants allocated you through the association. Loganov."

There's a pie for you.

Well, and what about our republic's Ministry of Geology and Zapukrgeologiya [West Ukraine Geology Association]? How do they relate to their offspring that is in Tyumen' land? Although the "deep meters" of the Ukrainian Expedition should go to the Glavtyumengeologiya plan, this does not relieve the Ukraine of either personnel or organizational concerns.

Judging by everything, this is well understood. This year Deputy Minister V. I. Stepkin, Zapukrgeologiya General Director P. I. Spasskiy and other responsible workers of the ministry and the association visited Novyy Urengoy. Their help was substantial in allocating fixed capital for the expedition: 2 truck cranes, 7 motor vehicles, a set of metal-cutting machine tools, welding equipment, blowout preventers, drilling shelters, 4 radio sets, 12 refrigerators, 9 television sets, and so on and so on--in all, more than 30 items.

Where climatic conditions are statistically average for most of the country and transport ties are flexible and have been shaken down over the years, an excess of long-term reserves in enterprise warehouses does direct harm to the national economy. In the North, the consideration is different. The railroad still does not reach Novyy Urengoy, and there is not and will not be a waterway--the Pur River is almost 100 kilometers away, and during the navigation season all the cargo that arrives on it has to be reshipped to the expedition by air or by motor vehicle. You do not ship much by helicopter; you can fly into a financial dead-end--each hour of operation costs 650 to 850 rubles, and the requirement for local air hauling, as it is, is constantly growing--the amount of work planned by the expedition for 1982 is 1,100 hours for an Mi-8, 400 hours for an Mi-6. There remains automotive transport. And it is on heavy, powerful vehicles, and basically during the winter, that materials and equipment for all organizations working in the arctic are brought in. From November through April the roads--winter-type roads--operate at full load, sometimes the drivers do not leave the steering wheel for days. Winter is the peak period for bringing freight to the North.

But it is necessary to pay for all the work that is being accumulated for the next 6 months to a year. And to pay in advance. For this purpose, all the local expeditions have specially allocated credits for importing physical assets ahead of time. In the Ukraine they "fight" above-norm reserves, but in the North this is regarded as meritorious. But this factor was let slip. As a result, it is necessary now to bring in more than a million rubles' worth of freight over the winter

road, but there is no credit. A merry-go-round of telephone calls, telegrams, radiograms and letters between Novyy Urengoy, L'vov (where Zapukrgeologiya is based), Tyumen' and Kiev yielded no result, and by 1 January of next year it is expected that the expedition's indebtedness will total about 1½ million rubles. Insolvency of the Ukrainian NGRE [Oil and Gas Exploration Expedition] will cause Urengoyneftegazgeologiya and automotive enterprises that are subordinate to the main administration, which have the expedition under contract, to refuse to allocate it transport and to issue it the necessary materials.

"Interesting matters," said USSR Deputy Minister of Geology R. A. Sumbatov pensively when I acquainted him in Moscow with the situation existing in the Ukrainian expedition. "It is evident that despite everything, we have been hurried in boosting deep drilling in the Arctic. Probably if preparations had been made more thoroughly, losses now would be somewhat less. As for the credit, why was this question delayed until October? Who should seek out these 1½ million and where should he look? Roman Sumbatov, in his pocket? And the equipment necessary for deep drilling, particularly high-strength casing and drilling pipe, combustibles, cement, and so on, we are giving these to the main administration. But who specifically among the Ukrainian comrades knows where it has gone to? In point of fact, there is no such energetic, knowledgeable person with initiative who will speak, if you please, with the authority of the Ukraine's Mingeo [Ministry of Geology]. But one is needed. He is needed even if we decide to convert the Ukrainian Expedition next year to centralized supply, bypassing the main administration."

It would seem that R. A. Sumbatov's opinion about the responsibility of trained geological explorers is directly connected with a single problem. We are talking about the rotating reliefs. When workers brigades that are, on the whole, equivalent in skill and experience are changed with precision at the drill rigs, then they are justified from most points of view, although a number of questions will still require study--for example, the selection of people for the expeditionary rotating-relief method, periods of work during the relief, the drillers' rest, and other questions. When the supervisors of the drillers or of the expedition's base subunits fly away to the "continent," then, you will agree, it is not so simple to find a replacement who is equivalent in knowledge of conditions and production specifics and in degree of responsibility, and, moreover, for a period of only two or three weeks, that is, until the return of those who left. In brief, we are referring to the fact that engineers and technicians do not feel that they are in the North on a business mission, but conduct their business from day to day, constantly, without turning over the business to anyone, from vacation to vacation or from relief to relief.

It is natural that this can be done only on an exclusively voluntary basis. It is natural that in such a case the man should be together with his wife, and the wife with her husband. It is natural that this will require great efforts in organizing domestic amenities. But another thing is natural--the main thing--daily engineering and technical oversight are necessary for complicated production. This is obvious. There are cases of this kind in the expedition, and the first apartment in Novyy Urengoy was assigned to one, and if the ministry will rely some more on young specialists who are unburdened, as a rule, with children or households. Then the problem, in all its complexity, can be solved completely.

Another thing that should be given thought. The Ukrainian expedition, like any other one, does not have the rights of an independent enterprise, with all the

financial-settlement and supply-resource consequences that ensue from it. So the question of creating a deep-drilling geological production association on the basis of several expeditions--there are two already--arises. The UkSSR Ministry of Geology could be the initiator in its establishment.

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# GENERAL REQUIREMENTS FOR OFFSHORE OIL, GAS FIELD DEVELOPMENT

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 81 pp 8-9

[Article by T. G. Velikov, deputy minister of Gas Industry: "The Prospects for Developing Drilling Operations Offshore"]

[Text] An expansion of the work front for conquering the continental shelf's reserves requires the most rapid solution of a number of problems, among which questions of the organization, equipping and technology of offshore drilling and of training personnel should be singled out.

During the last 20 years an intense mastery of offshore oil and gas fields has been observed throughout the entire world. According to foreign statistics, by the start of 1980 about 20 percent of the world's recovery of oil will come from fields located at the bottom of the sea.

For a long time the exploration and development of these fields was held back by factors of a technical and an economic nature. The cost of a well drilled offshore is often 10-fold or more that of a similar well drilled on dry land.

However, the limited extent of "dry-land" oil and gas reserves compels that all new regions of the sea, regardless of water depths, climatic conditions and the enormous expenditure of funds, be mastered.

In September 1980, according to data of the journal OFFSHORE, 466 floating drill rigs were operating in various seas of the globe and 142 were being built, not to mention the fixed offshore platforms and built-up or ice islands that are used for drilling in comparatively shallow depths.

In our country, systematic work to assimilate offshore oil and gas fields was started in the Caspian back in the 1920's when, at the initiative of S. M. Kirov, drilling from a built-up levee and islands in Il'ich Bay were undertaken. Since then much work experience has been gained and important successes achieved. A large number of oil and gas fields were discovered, not only at the western but also at the eastern coast of the Caspian. Hundreds of kilometers of trestles and underwater oil and gas pipelines have been built. The recovery of "offshore" oil increased more than 5-fold in the next 30 years.

However, the discovery in the 1960's of a large number of oil and gas fields in Siberia overshadowed the work in the Caspian for a certain time with their immensity. The main efforts were thrown into the assimilation of these fields, which are located in regions difficult of access, so the pace of offshore work dropped off somewhat, and a lag behind the world level was projected. Only in the past decade has the drilling of deep wells in the offshore waters of the Black Sea, the Sea of Azov and the Okhotsk Sea been undertaken, and only 5-6 years ago did domestic industry begin to produce floating drill rigs.

The organization, equipment and technology of drilling offshore have a number of specific peculiarities, which are either entirely uncharacteristic of drilling on land or are not of much significance there.

Isolation from the supply base, caused by the substantial distances and by a dependence on weather conditions, requires that offshore drill rigs have high self-sufficiency and survivability. These drill rigs must maintain a large reserve of materials, tools and spare parts. Drill rigs should be provided with sets of equipment for doing geophysical research, for cementing casing strings and for sampling wells. In so doing, measures for protecting the environment should not be forgotten.

In order to meet these prerequisites, additional production space is required, as is an increase in the load-carrying capability of the structure, which leads to a substantial rise in costs for the drilling complexes.

All this presents special demands on the equipment and materials that are used in offshore drilling.

The equipment should be compact and highly productive and possess high reliability, since downtime and repair work on offshore drill rigs at times costs 10-fold what it would on land, because of the high amortization deductions. Increased demands for equipment reliability are required also by the fact that in case of a serious emergency it is much more difficult than on land to evacuate servicing personnel and to take measures to prevent harm to the environment.

Especially high demands are made on mud-control facilities, since any excess of drilling mud and drilled-out rock has to be stored at the drill rig and then sent off to another place for use or for removal of harmful components and burial. Unsatisfactory operation of the cleaning installations leads to a manifold increase in costs for chemical reactants, but this involves an increase in reserves thereof on the drill rig and additional transportation costs.

Chemical reactants for offshore drilling should possess high effectiveness (because of the limited amount of storage space and the high cost of transportation) and low toxicity (in case of release of them into the sea during loading and unloading operations or during an emergency) and be free of combustible components.

The organization of offshore drilling should be aimed at maximum reduction in the amount of auxiliary operations, since conducting them requires additional personnel, equipment and space, leading to much greater operating costs.

The severest problem is the training of personnel, especially for floating drilling facilities.

While on land, drilling takes only the first step toward the utilization of automation, electronics and remote control, the work of modern floating drill rigs without these means is practically impossible. Such operations as setting down at the point of drilling and removal therefrom, ballasting, maintenance (positioning) of the installation at the drilling point, compensation for wave fluctuations, and monitoring of the underwater wellmouth are unthinkable without automation, electronics and remote control. But not one educational institute of the country trains specialists of this qualification for offshore drilling. The syllabi of petroleum vuzes and tekhnikums do not call for a course of lectures that considers the specifics of offshore drilling. There is not one textbook that throws light on these questions. Catalogs and GOST's [State All-Union Standards] are lacking for many types of equipment and tools, and instructional materials for developing design and budget-estimating documentation have not been put to use.

There are many problems, and most of them require the most rapid solution.

In considering the imminent necessity for speeding up the pace of and for expanding the work front for assimilating the continental shelf's reserves, a Main Administration for the Exploration and Development of Offshore Oil and Gas Fields--Glavmorneftegaz--to which all the scattered enterprises that had previously solved these tasks under the aegis of several ministries have been subordinated--was organized under the Ministry of Gas Industry in 1978.

The creation of a single administration has already given tangible results, even in the organizational period. New fields have been discovered in the Okhotsk and Black Seas and the Sea of Azov. A fixed platform for drilling on the Baltic shelf is being built. The design of ice-resistant fixed platforms and of ice islands has commenced.

The party and the government constantly pay attention to the buildup of Glavmorneftegaz, extending the necessary help on all questions.

Technical reequipping of the offshore subbranch is progressing at an increasing pace. During the current five-year plan the number of floating drill rigs is being more than tripled, and the displacement tonnage is being increased more than 6-fold. A plant for making metal structure for the erection of fixed deepwater platforms is being built, and existing shore bases are being expanded and new ones are being built in the Sea of Azov and in the Black, Baltic and Okhotsk Seas.

Very important tasks lie ahead for Glavmorneftegazprom. Offshore drilling volume should increase almost 1.5-fold. Penetration should increase more than 2-fold on the Okhotsk Sea shelf and more than 2.5-fold on the Black Sea and Sea of Azov shelves. Large amounts of drilling are to be carried out on the Baltic Sea shelf. The share of meterage drilled from floating drill rigs should be increased from 5.4 percent in 1980 to 10.6 percent in 1985.

The drilling of wells at sea depths of more than 100 meters is to be mastered, and a large number of problems associated with drilling in arctic seas are to be solved.

The country is entrusting high-capacity, expensive equipment to Glavmorneftegaz's drillers, and all measures must be taken to use it wisely, thriftily and in such a way that will cause no harm to our seas or offshore fields.



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# TYPES OF SHIPS, PLATFORMS NEEDED FOR OFFSHORE OIL, GAS FIELDS

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 81 pp 10-11

[Article by N. M. Nemchinov, deputy minister of Gas Industry: "The Oil and Gas Fleet Is in a New Stage of Development"]

[Text] An expansion of the geography of the regions and an increase in the sea depths of modern oilfields and in the distance to shore require the development and introduction of ever more complicated operating facilities, an increase in their reliability and effectiveness, and a radical reexamination of the methodology for training personnel.

Different meteorological, hydrological and geological conditions and different sea depths dictate a diversity of floating operating facilities for the recovery of oil and gas. These are scientific-research and engineering-geology ships, self-elevating and semisubmersible floating drill rigs, drilling and erector-crane ships, powerful tugs, ships for supply, rescue and firefighting, dry- and liquid-cargo ships, passenger ships, floating hotels, floating pipelayers, ships for burying pipe, ships for mopping up accidental oil spills, barges that are self-unloading, ships for diving and underwater engineering operations, habitable and remotely controlled underwater equipment, and diving complexes for prolonged work by humans at great depths.

The distinguishing features of specialized operating facilities and ships for developing the continental shelf are great strength, the presence of high-capacity highly-manipulatable power installations, modern navigational and geophysical equipment, drilling derricks, fixtures and mechanisms for drilling wells, and the capability to take helicopters aboard.

In recent years offshore oil and gas fields have been supplied with self-elevating floating drill rigs and new floating operating facilities, for example, the scientific-research ship "Iskatel'," which is intended for offshore geological and geophysical operations, the motorship "Ali Amirov" for engineering geology surveys and the preparation of areas for setting up platforms, the marine self-propelled single-hull transporting and erector-crane ship "Azerbaydzhan," which is used for loading, transporting, unloading and installing modules for the upper structures and large-dimension modules for offshore foundations and for driving piles for the construction of fixed oil and gas field structures, supply ships of the "Araks" and "Desna" types--ships that are intended for hauling large-dimension cargo (drill

pipe and drill bits) and for the delivery of cement, barite, fresh water and fuel for the drill rigs, tugs for floating drill rigs, and other floating facilities.

In the near future, drilling ships intended for exploratory drilling at sea depths of up to 300 meters and a drilling depth of 6,500 meters are to go into operation. The length of one of these ships, the "Valentin Shashin," is 150 meters, and it displaces about 18,000 tons. The ship, which is of the reinforced icebreaker class, has a system of dynamic positioning that enables the ship to be held at the drilling point without paying out anchor when the sea state is below high seas. At the disposal of the drillers are automatic systems for the preparation and processing of drilling mud and for stacking drill pipe. There are blowout preventers, which enable the spontaneous discharge of oil and gas to be averted, and a platform for receiving helicopters.

Deepwater diving complexes which are now being created are to be installed on ships and floating drill rigs intended for the exploration of offshore oil and gas fields.

These complexes will enable diving work to be performed at depths of up to 300 meters, enabling servicing of the underwater wellhead equipment, inspection of the supports of the fixed deepwater platforms and of self-elevating drill rigs, the mothballing and demothballing of wells, and the inspection and repair of underwater pipelines.

For the performance of the main underwater engineering operations, special diving ships will be equipped with mechanized diving tools, underwater habitable and remotely controlled apparatus, and special instruments and equipment for observing underwater pipelines and structures, for monitoring their condition and for making subsequent repairs.

For example, the ship "Sprut," which will be at the disposal of offshore oil and gas recovery workers this year, has been equipped with a satellite navigation system that will provide for its operation in northern latitudes and for proceeding to a prescribed point with high precision. A dynamic positioning system guarantees that the ship will stay above the site of the underwater operations.

For carrying out diving operations, there are to be a deepwater complex, which will enable two brigades of divers to work at depths up to 300 meters for one to two months, two habitable underwater units, one of which can deliver divers to an area distant from where the ship is stopped, while the other is a remotely controlled unit that will enable the surveying of large seabed areas, observation of underwater objects (including those washed smooth by silt), the tracing of pipeline routes, the nondestructive monitoring of pipelines and of metal structure, and the performance of motion-picture photography underwater.

Operators will be able to carry out individual operations on underwater equipment or pipelines by means of manipulators of the habitable underwater apparatus.

The "Sprut" has high-capacity load-lifting devices and a pad for landing helicopters, which will permit offshore delivery of cargo and people, the replacement of divers and of the crews of underwater equipment, and extension of the necessary technical and medical assistance to the ship's crew.

During the 11th Five-Year Plan the following will enter into the inventory of active ships and floating operating facilities:

ships for conducting integrated geophysical research that meet modern marine-navigation requirements, are equipped with highly precise equipment, are large in size and displacement (2,500 and 4,000 tons) and have fine-steering devices and ship stabilizers;

ships for engineering-geology surveys at sea depths of up to 200 meters, with displacements of 1,500-3,000 tons, capable of supporting study of the physical and mechanical properties of the soil in its natural setting, and are supplied with a system for dynamically maintaining position over the spot where the work is being done;

self-elevating floating drill rigs for drilling at sea depths of up to 100 meters and a drilling depth of less than 6,500 meters, with a displacement of about 15,000 tons;

self-elevating erecting-crane ships with a crane load-lifting capability of 40 to 2,500 tons, based upon the traditional single-hull design, and a new design for a double-hull (catamaran) ship, as well as semisubmersible platforms that will be able to haul cargo of large dimensions and weight;

supply ships with main-engine power of 53 and 31 kilowatts, a load capacity of 1,300 and 700 tons, reinforced ice-resistant hull that will enable navigation to be performed in pack ice; and accessories for towing complicated facilities (SPBU's [fixed-platform drill rigs] and PPBU's [semisubmersible floating drill rigs];

firefighting ships for extinguishing fires at offshore oil and gas fields with a displacement of about 2,300 tons and a total turret nozzle fire hose capacity of 4,000 cubic meters of water per hour;

ships for diving and underwater engineering operations, equipped with deepwater diving complexes for work at depths of up to 300 meters, a system for dynamic positioning, a helicopter complex, load-lifting devices for lowering and lifting operating equipment mounted on the seabed and underwater units, and underwater apparatus, including: self-contained habitable underwater apparatus with devices for the exiting of divers and for work at depths, a self-contained habitable observation (or research) underwater apparatus, a remotely controlled multiple-channel device for locating and laying marker buoys, and a diver-group transporter and a unit for towing individual divers;

passenger ships for 50, 70 and 600 people with no restriction on region of navigation, for delivering drilling brigades to platforms and also for the large-scale hauling of passengers from the port of Baku to Neftyanyye Kamni;

rescue and salvage vessels for extending assistance to ships and floating drill rigs, saving people and extinguishing fires, with main-engine power of 22 and 52 kilowatts; and

dry-cargo and liquid-cargo ships with load capacities of up to 5,000 tons, for hauling large-scale cargo, fuel and water to remote drilling facilities.

In carrying out the instructions of the party and government to master the continental shelf, the Ministry of Gas Industry, in close collaboration with interdependent branches of the national economy, is persistently solving the most important tasks for developing the supply and equipment base for mastering the shelves' resources.



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# MARINE ENGINEERING GEOLOGY'S SUPPORT FOR OFFSHORE DRILLING EXPLAINED

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 81 pp 13-14

[Article by A. I. Pavlenkov (VNIImorgeo [All-Union Scientific-Research Institute for Marine Geology and Geophysics]): "Marine Engineering Geology: Practice and Tasks"]

[Text] Marine engineering geology, because of the nature of the tasks being solved, the methods and equipment used in its research, and the importance of these tasks and this research in the national economy's overall complex for mastering the seas and the World Ocean, is a new and rapidly developing branch of the offshore oil and gas industry.

Mastery of the shelf's oil and gas resources has posed to engineering geology a number of tasks that involve the construction of explorational and operating structures offshore and the use of various types of platforms and specialized ships for deep drilling.

Depending upon the tasks set, marine engineering geology research is being conducted with a distinct comprehensiveness of detail: from the regional details, for the purposes of making forecast assessments of engineering-geology conditions for the regions of the shelf that promise to be oil and gas bearing, to the details for the various stages of design of offshore structures.

The thick series of strata--as much as 200-300 meters deep in places--of loose sediments that have developed over vast regions of the shelf, covered on top with poorly consolidated sedimentation, causes a broad complex of modern geological and geophysical methods (geophysical, geological, geotechnical, laboratory, hydrological and meteorological) to be used in marine engineering-geology research.

Characteristic features of marine engineering-geology operations in comparison with land operations are the high productivity and informativeness of geophysical methods, the low labor intensiveness of geological means for studying soils, and the substantial technical complexities and comparatively low productivity of offshore drilling from specialized ships.

At present, during marine engineering-geology operations in the preparation of areas for deep drilling, we usually use echo-sounding, seismic-acoustic profiling, the recovery of soil-profile samples with sampling tools, and the drilling of engineering-geology holes, and we later study the physical and mechanical

characteristics of the soils based upon the models in the laboratory environment. A broader set of methods is used in engineering-geology research of the shelf of the USSR's eastern seas, where determinations of the soils' mechanical properties are made by holes in the natural bedding and special hydrological observations are being conducted in great volume.

In seas with heavy icing conditions, marine engineering-geology research is carried out by modern operating facilities for geophysical and geological methods of studying the seabed structure, including methods specially developed for the characteristics of the material composition of the broken-up sediments and bedrock according to seismic observation data.

In many water bodies with sea depths of less than 40-60 meters, the drilling of engineering-geology holes is accomplished from small reequipped ships which have been adapted for the installation of ZIF-650 type drilling units on them. On going to greater depths, specialized drilling ships are used that are equipped with dynamic stabilization and compensation for the vertical movements from oscillating motion.

The engineering geology of USSR seas has not been studied uniformly. The water bodies that the industry has been mastering have been studied more completely. The prospecting, exploration, recovery and transporting of oil and gas, which generate the need to build especially complicated hydraulic-engineering structures of various types in the open sea, present exceptionally rigid demands on the precision and informativeness of engineering-geology surveys and on the extent to which they have been supplied with highly technical equipment.

Because of this, the engineering-geology study of water bodies is being performed in several stages, beginning with regional reconnaissance research prior to a detailed study of the engineering-geology conditions of the sites that have been picked out for the construction of offshore hydraulic-engineering structures.

On the whole, engineering-geology information has been obtained for the shelf of many water bodies that will permit baseline data to be issued at a given stage, both for planning the assimilation of regions that are promising for the oil and gas industry and for the preliminary design of individual specific structures. Accordingly, the long-term plan for the exploration and recovery of oil and gas that has been developed requires a substantial intensification of technical reequipping, an increase in the volume of marine engineering-geology operations, and the training of a large number of specialists of various fields for the different types of these operations.

Assimilation of new shelf regions that hold promise of bearing oil and gas has posed to engineering geology complicated tasks with respect to developing new and effective methods of marine research and reequipping engineering geology with modern ships (up to 2,500-3,000 tons) and automated equipment and apparatus.

VNIImorgeo in the past decade has developed and introduced into offshore operations highly precise seismo-acoustic methods and apparatus for studying the upper portions of the cross section, seismic and electrical-measurement methods for mapping bedrock surfaces, methods and apparatus for pressiometry and penetration, methods and technical facilities for the planned tie-in of geological and geophysical measurement points (RGS [network of geodetic ties]), and for the automated control of ships, and methods and technical facilities for taking samples at various sea depths.

In the plan for further developing offshore engineering geology, it is necessary:

to study the peculiarities of the forming and to find the laws that govern the three-dimensional variability of the engineering-geology conditions of shelf regions that hold promise of bearing oil and gas;

to study contemporary geological processes and phenomena (including cryohydrogeological) and to evaluate their role in preserving the stability of the soil masses in the natural environment of the sea medium and in interaction with engineering structures; and

to develop new methods and procedures for studying engineering-geology conditions.

The task of developing basically new methods and technical facilities for marine engineering geology research that will permit offshore work processes to be automated, with a view to obtaining all data about the structure and properties of soils in the conditions of their natural bedding, is to be faced in the new era of scientific and technical research.

Questions of training technical personnel for marine engineering geology, including specialists of higher qualifications, require urgent solution.



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# TECHNIQUES FOR BUILDING, DELIVERING OFFSHORE DRILLING PLATFORMS DESCRIBED

Moscow GAZOVAYA PROMYSHLENNOST' in Russian No 9, Sep 81 pp 14-15

[Article by A. M. Dzhafarov (Gipromorneftegaz [State Scientific-Research and Design Institute for Offshore Oil and Gas Facilities]): "The Design and Construction of Deepwater Platforms"]

[Text] For purposes of accelerating the development of deepwater offshore oil and gas fields, the main efforts of design and design-development organizations should be aimed at improving methods of studying the hydrometeorological conditions for deepwater bodies and at developing scientific and practical recommendations for creating equipment for conquering the shelf.

Growth in industrial production in most countries of the world is causing a continuously increasing demand for fuel, especially for oil and gas. The experience of the past 20 years indicates that this requirement will be met partially by offshore recovery, which, in time, will become extremely essential in the overall balance. Thus, mastery of the mineral resources (primarily oil and gas) of the continental shelf and of the World Ocean is one of the more urgent problems of modern times.

The assimilation of offshore fields is organically linked with the creation and the continuous development of offshore oil and gas equipment and technology for performing work at sea and with the construction of oilfield structures for various purposes.

As a result of many years of work on assimilating the Caspian sea's offshore fields, substantial experience has been gained in the design and construction of fixed platforms, the design-development solutions of which have improved as sea depths have increased and as transporting, erecting and construction equipment have been developed.

It should be noted that adequate study of the Caspian's hydrometeorological conditions and experience in the organization and performance of offshore work have developed in us an "individual touch" in designing solutions for stationary platforms which incorporate our own achievements, the experience of world practice and an optimal consideration of the possibilities and specifics of construction in the Caspian Sea.

Until recently, fixed platforms in the Caspian for sea depths of up to 30-40 meters were made out of several three-dimensional see-through support modules of prismatic

shape, all elements of which were manufactured from pipe up to 500 millimeters in diameter. The support modules are transported on the deck of floating cranes, which set them on the seabed. The modules are fastened together by piles that have been driven or predrilled through corner pillars. The number of modules in a structure and the scheme for their placement are determined by the purpose of the structures, the number of wells and sea depth.

Much work is being done now to create and introduce unified structural solutions for fixed platforms for sea depths of less than 60 meters, which will enable metal-structure fabricating time at the plant and the total time taken for construction and erecting operations at sea to be reduced. These platforms consist of a modularized upper structure and single-module support, which is a three-dimensional lattice-work structure made of two or more prismatic columns connected at the lower part by a portal into a unified system. Along with this, we have developed designs for fixed platforms for greater depths.

For example, at the Structure imeni 28 Aprelya a four-module fixed platform, whose support modules are a truncated trihedral pyramid. In the upper part, the support modules are connected with sections of the metal structure that forms the work site on which the operating equipment, which permits the drilling of a cluster of 10 wells, is placed on one story.

The development of new design solutions and methods of building fixed platforms for sea depths of 100-120 meters is going on at an accelerated pace. These solutions are reflected in the new design for deepwater platform "28 Aprelya No 2," which is now under construction.

The design is solving questions of large-module erection of drilling and operating equipment, the technology of manufacturing components that are made of thick-walled large-diameter pipe, the manufacture of the three-dimensional modules and launching, transporting to the construction site, installation, and attachment.

The platform is made of two pyramidal modules, each 110 meters high and weighing up to 2,000 tons. One of the module's sides is made out of pipe 1,420 millimeters in diameter, which will provide it with buoyancy with a minimal immersion of less than 1.4 meters.

A special assembling and erecting site, equipped with launching rails, mechanisms and rigging, and also the launching installation, has been designed and built for fabricating and launching the platform's support modules.

Where depth of the water body at the shoreline is limited, the support module, which weighs 2,000 tons and has a floating side, is launched by means of launching rails which correspond with the configuration and engineering of the structure of the launching installation. This precludes the possibility of the module capsizing on the ramp, provides for controlled buoyancy at the permissible end-poppet pressure and limits the load on support-module structure at all stages of the launch.

Another important problem solved in the design is that of transporting the support module to the point of construction and installing it there. Properly the transporting should be performed with guaranteed provisioning of floatation, stability, holding to course, and other seagoing qualities. The unusualness of the shape and dimensions of the floating support module and the substantial towing distance

necessitated the use of some developments that have no counterparts in marine practice.

A special solution was required for raising the support module from the horizontal position for transport to the vertical and for installing it on the seabed at the prescribed point.

The center of gravity of the support-module structure, which consists of sealed elements, is, when submerged, higher than the center of volume. Therefore, it can be raised only with a definite system for taking on outboard ballast, under which, during the entire process, a strict ratio is maintained between the moment of the masses of the support module and the ballast and the moment of buoyancy. Such a system was developed for transporting and installing the support modules being examined. There is also the problem of attaching the fixed platform to the seabed. The institute developed a method for computing the load-bearing capability of driven piles, based upon wave theory. This methodology will enable long piles for deepwater platforms to be designed and conversion to be made from drilled and cast-in-place piles to the less labor-intensive precast piles.

This procedure was tested during experimental driving offshore of thick-walled large-diameter piles.

An important step in developing the buildups of fixed offshore platforms is the conversion to industrialized methods of installing the equipment. With this method the main volume of construction and installing work is transferred to the shore bases, where the equipment is installed in box modules that are then transported to sea and placed on the platforms's support modules.

The indicated solution was realized in the design of the deepwater platform "28 Aprelya No 2," based on serially produced drilling and operating equipment. Later, during fabrication of the modules for the upper structure of the platform, special drilling and operating equipment, on the creation of which a number of institutes and design bureaus are already working, will be used.

The technical and economic benefit from introducing the modular method of installing and building up facilities arises from: reduction of the area of the platform's foundation; reduction of the time spent offshore on construction and installing work; the potential for repeated use of the modules and of the modern highly productive equipment; shortening of the well-construction cycle; and a rise in the self-sufficiency of the platform.

The prospects for mastering offshore fields in the Caspian at water depths of 100-200 meters necessitates conversion to the development of designs of fixed offshore platforms of single-module design, since, as sea depth increases, the total installed weight of the support modules of multiple-module design is increased and the dimensions of the modules grow.

The creation of single-module platforms is associated with the solution of a set of scientific-research, experimental-design, and engineering-organization problems. Among them, a most important place is occupied by questions of creating the necessary set of operating facilities for removing and dispatching the single-module support from the erecting and assembling platform, as well as questions of transporting, installing and fastening it to the seabed.



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